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National
Qualifications
2026

Mark

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X847/75/02

Mathematics
Paper 2

FRIDAY, 8 MAY

10:30 AM – 12:00 NOON



* X 8 4 7 7 5 0 2 *

Fill in these boxes and read what is printed below.

Full name of centre

WORKED SOLUTIONS.

Town

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Forename(s)

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Surname

Hh

Number of seat

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Date of birth

Day

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Month

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Year

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Scottish candidate number

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Total marks — 50

Attempt ALL questions.

You may use a calculator.

To earn full marks you must show your working in your answers.

State the units for your answer where appropriate.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Do not remove any exam materials. You must leave this booklet on your desk; if you do not, you could lose all the marks for this paper.



* X 8 4 7 7 5 0 2 0 1 *

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$ or $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle $A = \frac{1}{2}ab \sin C$

Volume of a sphere $V = \frac{4}{3}\pi r^3$

Volume of a cone $V = \frac{1}{3}\pi r^2 h$

Volume of a pyramid $V = \frac{1}{3}Ah$

Standard deviation $s = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n-1}}$

or $s = \sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n-1}}$, where n is the sample size.



Total marks — 50
Attempt ALL questions

1. A van was valued at £22,600.

Its value depreciated by 28% each year for the next three years.

Calculate the value of the van after three years.

Give your answer correct to 3 significant figures.

4

$$100\% - 28\% = 72\% = 0.72$$

$$£22600 \times 0.72^3 = 8435.4048$$

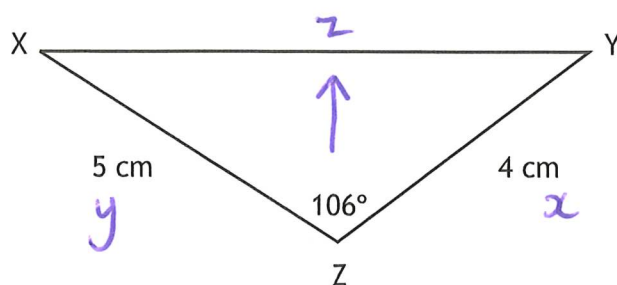
$$\underline{\underline{\text{Value after 3 years} = £8440 \text{ (3sf)}}}$$

[Turn over



* X 8 4 7 7 5 0 2 0 3 *

2. In triangle XYZ:



- $XZ = 5$ centimetres
- $YZ = 4$ centimetres
- angle $XZY = 106^\circ$.

Calculate the length of XY.

3

Cosine Rule

$$z^2 = x^2 + y^2 - 2xy \cos Z$$

$$z^2 = 4^2 + 5^2 - 2(4)(5) \cos 106$$

$$z^2 = 52.02549423$$

$$z = \sqrt{ANS}$$

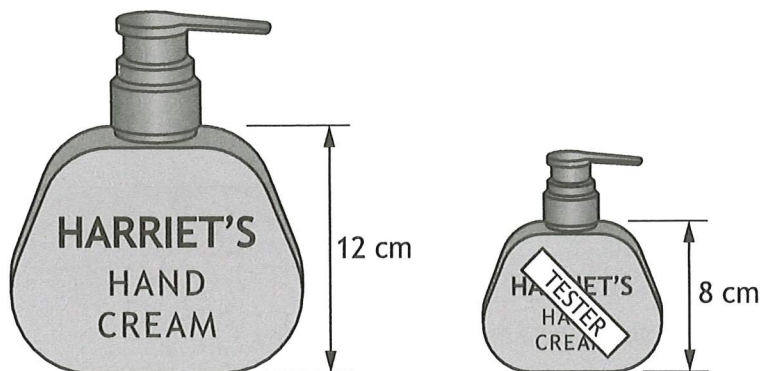
$$z = 7.21287...$$

Length XY = 7.21 cm (2dp)



* X 8 4 7 7 5 0 2 0 4 *

3. Harriet's Hand Cream is available in two sizes of bottles which are mathematically similar.



The larger bottle has a height of 12 centimetres and a volume of 540 millilitres.

The tester bottle has a height of 8 centimetres.

Calculate the volume of the tester bottle.

3

$$\text{Linear SFr} = \frac{\text{wee}}{\text{big}} = \frac{8}{12} = \frac{2}{3}$$

$$\text{Volume SFr} = \left(\frac{2}{3}\right)^3 = \frac{8}{27}$$

$$\text{Small Volume} = \frac{8}{27} \times 540$$

$$\underline{\underline{\text{Volume of tester bottle} = 160\text{ml.}}}$$

[Turn over



4. For a hobby, Alex makes cups and plates.

To make 5 cups and 6 plates, it takes Alex 45 minutes.

Let c be the number of minutes Alex takes to make a cup and p be the number of minutes Alex takes to make a plate.

- (a) Write down an equation in c and p to illustrate this information.

1

$$\underline{\underline{5c + 6p = 45}}$$

To make 7 cups and 4 plates, it takes Alex 52 minutes.

- (b) Write down an equation in c and p to illustrate this information.

1

$$\underline{\underline{7c + 4p = 52}}$$

- (c) Calculate, algebraically, the **total** number of minutes it will take Alex to make 10 cups and 8 plates.

4

$$5c + 6p = 45 \quad (\times 2)$$

$$7c + 4p = 52 \quad (\times 3)$$

$$\begin{array}{r} 10c + 12p = 90 \\ - (21c + 12p = 156) \\ \hline \end{array}$$

$$11c = 66$$

$$c = 6$$

$$5c + 6p = 45$$

$$5(6) + 6p = 45$$

$$30 + 6p = 45$$

$$6p = 15$$

$$p = \frac{15}{6} = \frac{5}{2} = 2.5$$

It will take
6mins to make
one cup and
2.5mins to make
one plate.

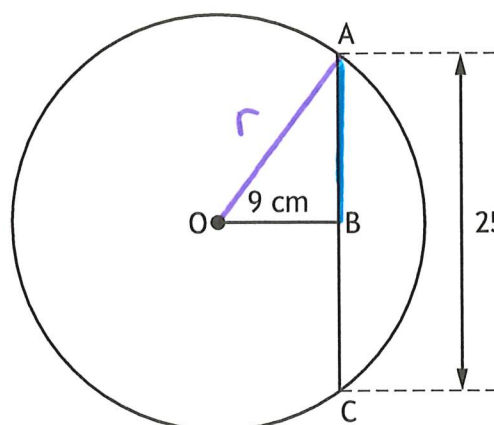
$$\begin{aligned} \hookrightarrow \text{Time} &= 10c + 8p \\ &= 10(6) + 8(2.5) \\ &= 60 + 20 \\ &= \underline{\underline{80 \text{ mins.}}} \end{aligned}$$

It will take 80mins
to make 10 cups
and 8 plates.



* X 8 4 7 7 5 0 2 0 6 *

5. The diagram shows a circle, centre O, with chord AC.

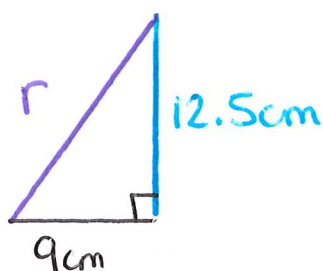


$$AB = \frac{1}{2} \text{ of } 25 = 12.5$$

- AC is 25 centimetres.
- B is the midpoint of AC.
- OB is 9 centimetres.

Calculate the length of the radius of the circle.

3



$$r^2 = 9^2 + 12.5^2$$

$$r^2 = 237.25$$

$$r = \sqrt{237.25}$$

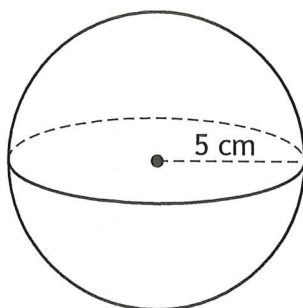
$$r = 15.4029...$$

$$\underline{\underline{\text{radius} = 15.40 \text{ cm (2dp)}}}$$

[Turn over



6. A sphere has radius 5 centimetres.



- (a) Calculate the volume of the sphere.

2

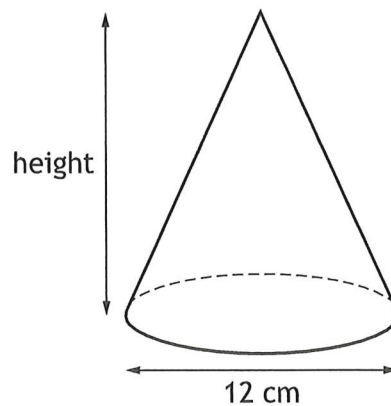
$$\begin{aligned} V_{\text{sphere}} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \pi \times 5^3 \\ &= 523.5987756... \end{aligned}$$

$$\underline{\underline{\text{Volume} = 523.60 \text{ cm}^3}} \quad (2\text{dp})$$



6. (continued)

This cone has the same volume as the sphere.



$$V = 523.60 \text{ cm}^3$$

$$D = 12 \text{ cm} \\ \therefore r = 6 \text{ cm}$$

The base of the cone has diameter 12 centimetres.

(b) Calculate the height of the cone.

3

$$V_{\text{cone}} = \frac{1}{3} \pi r^2 h$$

$$\frac{1}{3} \times \pi \times 6^2 \times h = 523.60$$

$$37.69911184 h = 523.60$$

$$h = \frac{523.60}{37.699111...}$$

$$h = 13.88892...$$

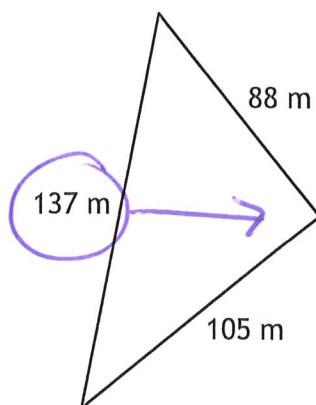
$$\underline{\underline{\text{height} = 13.89 \text{ cm (2dp)}}}$$

[Turn over]



* X 8 4 7 7 5 0 2 0 9 *

7. A triangle has sides of length 88 metres, 105 metres and 137 metres.



Determine whether the triangle is right-angled.

Justify your answer.

3

Consider $137^2 = 18769$

Consider $88^2 + 105^2 = 18769$

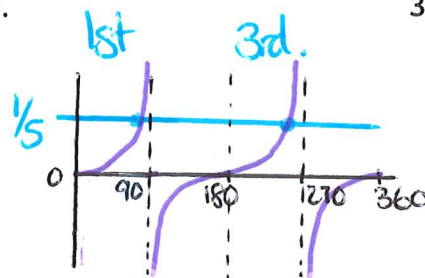
Since $88^2 + 105^2 = 137^2$, then
the triangle is right-angled.



8. Solve the equation

$$5 \tan x^\circ + 3 = 4, \text{ for } 0 \leq x < 360.$$

$$\begin{array}{r} -3 \quad -3 \\ 5 \tan x = 1 \\ \tan x = \frac{1}{5} \end{array}$$



3

$$ra = \tan^{-1}\left(\frac{1}{5}\right)$$

$$ra = 11.3099\dots$$

$$x = ra, 180 + ra$$

$$x = 11.3, 180 + 11.3$$

$$\underline{\underline{x^\circ = 11.3^\circ, 191.3^\circ}}$$

9. Express

$$\frac{x^2 - 81}{5} \div \frac{x + 9}{2}, \quad x \neq -9$$

as a single fraction in its simplest form.

3

$$\hookrightarrow \frac{(x^2 - 81)}{5} \times \frac{2}{(x + 9)}$$

$$= \frac{2(x^2 - 81)}{5(x + 9)}$$

$$= \frac{2(x - 9)(x + 9)}{5(x + 9)}$$

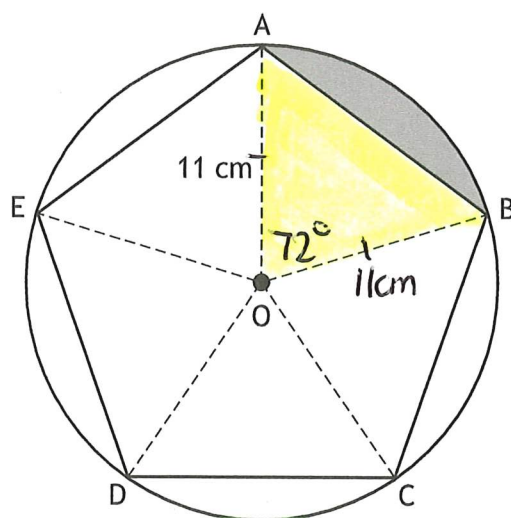
$$= \underline{\underline{\frac{2(x - 9)}{5}}} \quad \left(\text{or } \frac{2}{5}(x - 9) \right)$$

[Turn over]



* X 8 4 7 7 5 0 2 1 1 *

10. The vertices of a regular pentagon, ABCDE, lie on a circle, centre O.



Angle at centre
 $360 \div 5 = 72^\circ$

The radius of the circle is 11 centimetres.
 Calculate the area of the shaded segment.

5

Triangle

$$A_{\Delta} = \frac{1}{2} ab \sin C$$

$$A_{\Delta} = \frac{1}{2} \times 11 \times 11 \times \sin 72$$

$$A_{\Delta} = 57.53891... \text{ cm}^2$$

Sector

$$SA = \frac{\theta}{360} \times \pi r^2$$

$$SA = \frac{72}{360} \times \pi \times 11^2$$

$$SA = 76.02654... \text{ cm}^2$$

$$\begin{aligned} \text{Shaded segment} &= \text{Sector} - \text{Triangle} \\ &= 76.02654... - 57.53891... \\ &= 18.48763... \\ &= \underline{\underline{18.49 \text{ cm}^2}} \quad (2\text{dp}) \end{aligned}$$



* X 8 4 7 7 5 0 2 1 2 *

11. Simplify $\frac{a^{17}}{(3a^4)^3}$.

3

$$\frac{a^{17}}{(3a^4)^3} = \frac{a^{17}}{27a^{12}} = \frac{a^5}{27} \quad (\text{or } \frac{1}{27} a^5)$$

12. Express the following in its simplest form:

$$\cos x^\circ \sin^2 x^\circ + \cos^3 x^\circ.$$

Show your working.

2

Factorise HCF $\cos x (\sin^2 x + \cos^2 x)$

(Trig Identity! $\sin^2 x + \cos^2 x = 1$.)

$$\hookrightarrow \cos x (1)$$

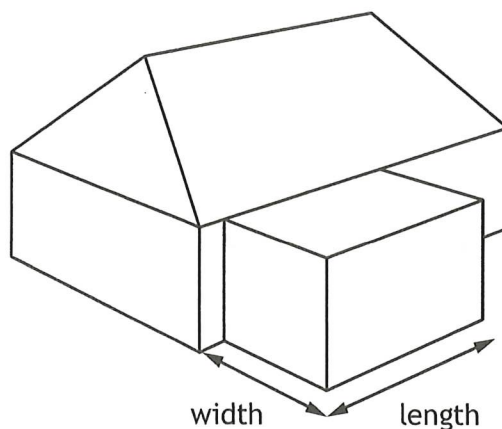
$$= \underline{\underline{\cos x}}$$

[Turn over

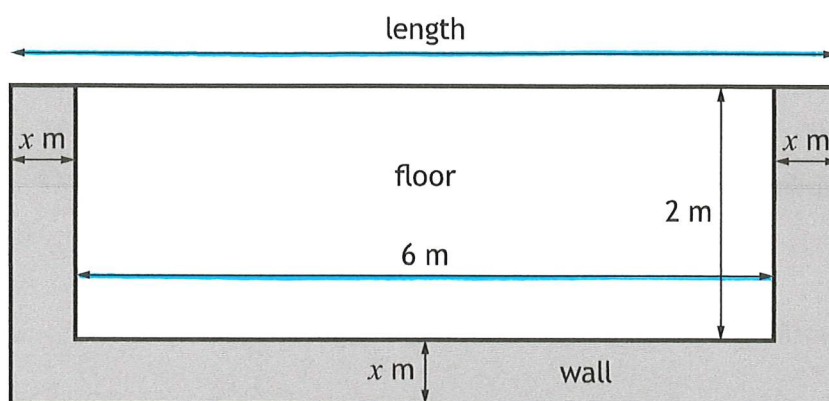


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13. An extension with a rectangular base is being added to the rear of a house.



The diagram below shows a plan of the rectangular base of the extension.



The length of the floor is 6 metres and the width of the floor is 2 metres.
There is a wall x metres thick on three sides of the extension.

- (a) Write down an expression for the length of the extension in terms of x .

1

$$\text{Length} = x + 6 + x$$

$$\underline{\underline{\text{Length} = 2x + 6}}$$



* X 8 4 7 7 5 0 2 1 4 *

$$\text{Breadth} = x + 2$$

13. (continued)

The total area of the rectangular base of the extension is 17 square metres.

(b) Show that $2x^2 + 10x - 5 = 0$.

2

$$\text{Area} = (2x + 6)(x + 2) = 17$$

$$2x^2 + 4x + 6x + 12 = 17$$

$$\underline{\underline{2x^2 + 10x - 5 = 0}} \text{ as required}$$



(c) Calculate x , the thickness of the wall.

Give your answer correct to two decimal places.

4

$$\text{Solve } 2x^2 + 10x - 5 = 0$$

$$ax^2 + bx + c = 0$$

$$a = 2$$

$$b = 10$$

$$c = -5$$

$$\text{Disc.} = b^2 - 4ac$$

$$= (10)^2 - 4(2)(-5)$$

$$= 100 + 40$$

$$= 140$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-10 \pm \sqrt{140}}{4}$$

$$\underline{\underline{x = 0.46 \text{ m (2dp)}}}$$

$$x = \frac{-10 - \sqrt{140}}{4}$$

$$x = \frac{-5.45803...}{4}$$

but $x > 0$.

$$x = \frac{-10 + \sqrt{140}}{4}$$

$$x = 0.45803...$$

[END OF QUESTION PAPER]



* X 8 4 7 7 5 0 2 1 5 *

